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Examiner: A. Chambliss
Art Unit: 2814
Docket No.: 52433/545

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : K. TATSUMI, et al.

Serial No.: 09/254,119

Filed : April 16, 1999

For : SEMICONDUCTOR DEVICE PROVIDED WITH LOW MELTING
POINT METAL BUMPS AND PROCESS FOR PRODUCING
SAME

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Assistant Commissioner
for Patents
P.O. Box 2327
Arlington, VA 22202

AMENDMENT

SIR:

Kindly amend the claims of the above-identified
patent application as follows.

~~Cancel claim 1.~~

Add the following new claims 16 and 17.

--16. (New) A semiconductor device comprising
electrodes formed on a semiconductor chip, and bumps each
consisting of a spherically formed metal ball having a given
size, and adhesive bonded to the electrodes (8) for the
attachment of the bumps, wherein each electrode (8) includes
a layer of an electrode material (5) and at least one layer
(6, 7) laminated to the layer of the electrode material (5)
to avoid deterioration of bonding such that the at least one
layer (6, 7) has peripheral dimensions substantially the same

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as or larger than those of the electrode material (5).--

--17. (New) A semiconductor device comprising electrodes formed on a semiconductor chip, and bumps each consisting of a spherically formed metal ball having a given size, and adhesive bonded to the electrodes (8) for the attachment of the bumps, wherein each electrode (8) includes a layer of an electrode material (5) and at least one layer (6, 7) laminated to the layer of the electrode material (5) to avoid deterioration of bonding such that at least one of the at least one layer (6, 7) has a thickness which is smaller than that of the electrode material (5) and the at least one layer (6, 7) has peripheral dimensions substantially the same as or larger than those of the electrode material (5).--

Concluded
D1
--2. (Twice Amended) The semiconductor device according to claim 16 or 17, wherein the metal balls are adhesive bonded to the electrodes with a flux.--

D2
--3. (Twice Amended) The semiconductor device according to claim 16 or 17, wherein the electrodes are formed from an electrode material of Cu or a Cu alloy, Al or an Al alloy, or Au or an Au alloy.--

REMARKS

Reconsideration of the above-identified patent application, as amended, is respectfully requested. The present amendment is responsive to the Office Action mailed March 28, 2001 and the Advisory Action mailed October 2, 2001. A petition for an extension of time accompanies this amendment.

This application is a continuation continued prosecution application under 37 C.F.R. §1.53(d) of Application No. 09/254,119 filed April 16, 1999.

Support For New Claims

Support for new independent claim 15 may be found in the specification at page 5, lines 6-18 and page 9, lines 27-29; and in the drawings at Fig. 2 and Fig. 3.

Page 9, lines 14-18 disclose at least one layer laminated to the layer of the electrode material to avoid deterioration of the bonding.

Page 9, lines 27-28 disclose the peripheral dimensions substantially the same as or somewhat larger than.

Figs. 2 and 3 illustrate the at least one layer at 6, 7; the electrode material 5, and the electrode 8 which comprises 5, 6 and 7. Page 9, lines 6-9 disclose an Al alloy layer as the electrode material with an Ni layer and a Cu layer laminated to the Al alloy layer so as to firmly bond the semiconductor device to the substrate by the solder bump.

New independent claim 16 is the same as new independent claim 15 with the additional limitation that "at least one of the at least one layer (6, 7) has a thickness which is smaller than that of the electrode material (5)". This is illustrated in Figs. 2 and 3 of the drawings.

Dependent claims 2 and 3 have been amended to correct dependencies.

New matter is not being presented by the present amendment.

Prior Art Rejection

In the Office Action mailed March 28, 2001, claims 1-3 were rejected under 35 U.S.C. §103(a) as being unpatentable over Japan No. 6-333930 to Atsuhiko in view of U.S. Patent No. 5,542,601 to Fallon et al.

Claims 4-6 were rejected under 35 U.S.C. §103(a) as being unpatentable over Atsuhiko-Fallon and further in view of Japan No. 59-148352 to Hisao.

These rejections, as applied to the new and amended claims of the present amendment, are respectfully traversed.

It is submitted that neither Atsuhiko, Fallon or Hisao, alone or in any combination, disclose or suggest the structural arrangement of components recited in new independent claims 16 and 17 of the present amendment.

It is therefore submitted that new independent claims 16 and 17, and all claims dependent thereon, are patentable.

VERSION WITH MARKINGS TO SHOW CHANGES MADE

--2. (Twice Amended) The semiconductor device according to claim [1] 16 or 17, wherein the metal balls are adhesive bonded to the electrodes with a flux.--

--3. (Twice Amended) The semiconductor device according to claim [1] 16 or 17, wherein the electrodes are formed from an electrode material of Cu or a Cu alloy, Al or an Al alloy, or Au or an Au alloy.--

CONCLUSION

It is submitted that in view of the present amendment and foregoing remarks, the application is now in condition for allowance. It is therefore respectfully requested that the application, as amended, be allowed and passed for issue.

Respectfully submitted,

KENYON & KENYON

Dated: December 10, 2001

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